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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/635,652 | 08/07/2003 | Keizo Ohta | 723-1414 | 8790 |

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| EXAMINER | |
|---|---|
| THOMASSON, MEAGAN J | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 3714 | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

HH

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/635,652 | OHTA, KEIZO | |
| | Examiner | Art Unit | |
| | Meagan Thomasson | 3714 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *22 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 August 2003* is/are: a)☒ accepted or b)☐ objected t o by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 22, 2007 has been entered.

### *Response to Amendment*

The examiner acknowledges the amendments made to claims 1,6 and 7. Claims 1-7 are pending in this application.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1,6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over the description of shadow volume generation technique disclosed in "Cg Shadow Volumes" by Razvan Surdulescu (2003), herein referred to as Surdulescu, in view of "Real Shadows Real Time" by Tim Heidmann (1991), herein referred to as Heidmann. Surdulescu provides a description of shadow volume generation, a technique known since at least 1991 (as evidenced by Heidmann).**

Surdulescu discloses a shadow volume generation program that causes a computer to generate a shadow volume used for rendering a shadow cast by an object placed in a three-dimensional virtual space, wherein the shadow volume generation program causes the computer to execute the steps of;

writing a Z value corresponding to each pixel within a predetermined area including at least the shadow casting object, into a Z-buffer (Step 1 of the Z-Pass Algorithm description, P. 4: "fill[s] the depth buffer with the depth values for all points in the scene") using a light source placed in the virtual space as a viewpoint (P. 2, "In order to render the shadow volume, we must first determine the outline of model from the perspective of the light"); and

generating the shadow volume from a plane object by determining a position of each vertex of a plurality of polygons composing the plane object in accordance with the Z-value of each pixel written into the Z-buffer (P. 1, The shadow consist of many

polygons patched together. Each such polygon is a projection of a face of the original model, along light rays, onto the wall"), wherein the Z-value of each pixel written in the Z-buffer is unchanged during shadow volume generation (Step 2 of the Z-Pass Algorithm Description, P. 4: "Turn off depth buffer"). This feature is also disclosed by Heidmann on P. 2, 2nd paragraph, wherein "we do not change the values already in the z-buffer".

Surdulescu does not specifically disclose the shadow volume is generated from a plane object by determining a position of each vertex of a plurality of polygons composing the plane object, with regard to a direction perpendicular to a surface of the plane object. However, Heidmann discloses the specifics of the Z-Pass technique, including the feature that "Assume all polygons of the objects in your scene are drawn in a counter clockwise direction, so each polygon normal (Np) faces outward from the object (Figure 2). When a polygon is facing the light source, if the shadow volume face obtained by projecting an edge is drawn in the direction opposite that of the direction of the original edge, the normal of that face (Ns) will point outward from the shadow volume" (P. 3, col. 1), wherein the "normal" of a face is the vector perpendicular to said face. In other words, the Z-Pass technique disclosed by both Surdulescu and Heidmann generates a shadow volume of an object with regard to a direction perpendicular to a surface of the plane object.

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Surdulescu and Heidmann as both inventions are in the shadow volume generation field of endeavor.

**Claims 2-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the description of shadow volume generation technique disclosed in "Cg Shadow Volumes" by Razvan Surdulescu (2003), herein referred to as Surdulescu, "Real Shadows Real Time" by Tim Heidmann (1991), herein referred to as Heidmann, and further in view of Matsumoto (5,043,922). Surdulescu provides a description of shadow volume generation, a technique known since at least 1991 (as evidenced by Heidmann).**

A storage medium according to claim 1, wherein

- a shape of the plane object is defined by a plurality of vertices, each having different combination of an X-coordinate and a Z-coordinate (col. 7, lines 26-56), and
- in the shadow volume generation step, a Y-coordinate of each vertex of the plane object is determined in accordance with the Z value of each pixel written in the Z-buffer (col. 7, lines 9-56).

The storage medium according to claim 1, wherein

- the light source is a point light source (col. 12, lines 24-57 or col. 5, line 20), and
- the shadow volume generation step includes a step of determining a position of each vertex of the plane object with regard to a direction parallel to a surface thereof in accordance with the Z value of each pixel written in the Z-buffer (col. 12, lines 24-57). The parallel light is inherently disclosed by Matusmoto because multiple light sources arranged in a line is the equivalent of a parallel light source.

The storage medium according to claim 3, wherein

- a shape of the plane object is defined by a plurality of vertices, each having a different combination of an X-coordinate and a Z-coordinate (col. 7, lines 9-55), and

- in the shadow volume generation step, the X-coordinate and the Z-coordinate of each vertex of the plane object are determined in accordance with the Z value of each pixel written in the Z buffer (col. 7, lines 9-55).

The storage medium according to claim 1, wherein the shadow volume generation program further causes the computer to execute the steps of:

- placing the shadow volume generated at the shadow volume generation step in the virtual space in a virtual manner so that a height direction of the shadow volume coincides with a direction of light emitted from the light source (col. 7, line 40 – col. 8, line 13), and

rendering the shadow of the shadow casting object using the shadow volume placed in a virtual manner (col. 7, line 40 – col. 8, line 30).

***Response to Arguments***

Applicant's arguments with respect to claims 1-7 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Pertinent prior art includes Pieragostini et al. (US 6,437,782 B1), drawn to a shadow volume rendering method, and Bilodeau et al. (US 6,384,822 B1), drawn to a method for rendering shadows using a shadow volume and a stencil buffer.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Meagan Thomasson whose telephone number is (571) 272-2080. The examiner can normally be reached on M-F 830-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xuan Thai can be reached on (571) 272-7147. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Meagan Thomasson
August 2, 2007

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TC3700